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DYNAMICS OF THE QUALITATIVE INDEXES OF PEAT FUEL FOR 1940 - 1948

I. Ye. Belokopytov

/Tables and graphs are appended/

The furnaces presently used in electric power plants will economically burn lump peat with a 30-40 percent moisture content and milled peat with a 38-48 percent moisture content. The characteristics of peat fuel at the time of delivery to the consumer are shown in Table 1 (data taken over a period of years).

The moisture content of peat fuel in its natural form, i.e., natural fuel with the presence of ash and moisture, was more variable than the ash content or the calorific value of the combustible mass. The root mean square deviation (RMS) of the moisture content of peat fuel varied from 3.1 to 5.5 percent, of ash content from 2.3 to three percent, and of calorific value from 135 to 212 calories per kilogram. Variation in the moisture content of peat was quite considerable during the past nine years, from 1940 to 1948. Moisture content of lump peat varied from 32.6 to 39.6 percent, or seven percent at the time of processing and three percent at the time of delivery to the consumer. In the latter case, the moisture content was more stable because peat extracted in two different seasons was blended.

According to Table 1 and Graph 1, the moisture content of lump peat coincides with the root mean square deviation in such a way that for the past nine years the average moisture content of lump peat is decidedly less than 40 percent.

Milled peat, however, acts quite differently. As indicated in Graph 2, the moisture content of milled peat, at the time of processing and at the time of delivery to the consumer does not coincide at all. This is explained by the fact that peat of two different seasons is mixed and because milled peat absorbs moisture during storage. The moisture content of milled peat for the past nine years has ranged from 41.4 to 45.1 percent at the time of processing and 45 to 50.6 percent at the time of delivery.

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The average moisture content of peat fuel can be more accurately evaluated if peat fuel is classified by moisture content as illustrated in Graphs 3 and 4.

In the past nine years (1940-48), lump peat has shown considerable deviation in moisture content groups. For example, peat of 40 percent moisture content reached its maximum peak in 1944 and 1948 (see Graph 3). This coincides with the years when lump peat had the least average moisture content (see Graph 1).

According to Graph 4 milled peat below 40 percent moisture content reached its peak in 1944 and 1948. This also coincides with the years of least moisture content as shown in Graph 2. It was 41.4 percent in 1944 and 43.0 percent in 1948.

Tables 2 and 3 give indexes of peat fuel for individual peat trusts. As can be seen in Table 2, the qualities of hydropeat produced by the various peat trusts differed greatly. The average moisture content varied from 32.1 to 39 percent with a root mean square deviation of 1.9-4.2 percent, the ash content from 11.6 to 7.5 percent with a root mean square deviation of 0.4-2.6 percent, and the calorific value of the combustible mass from 5,497 to 5,684 calories per kilogram with a root mean square deviation of 24-100 calories per kilogram. The calorific value of natural peat of 2,623-3,050 calories per kilogram tallies with the variations in the moisture content, the ash content and the calorific value of the combustible mass.

In the case of milled peat (Table 3) the data give a somewhat different picture. The moisture content varied from 40.2 to 47.6 percent with a root mean square deviation of 1.1-3.7 percent, the ash content from 6.9 to 11.5 percent with a root mean square deviation of 0.7-2.3 percent, and the calorific value of the combustible mass from 5,355 to 5,908 calories per kilogram with a root mean square deviation of 34-129 calories per kilogram.

Along with the variation in moisture content, ash content, and calorific value of combustible mass, the calorific value of natural peat fuel produced by the various peat trust varied from 2,065 to 2,561 calories per kilogram, with a root mean square deviation of 135 to 355 calories per kilogram.

Indexes for machine-molded peat (Table 4) show that the average moisture content in the different trusts varied from 29.8 to 43.9 percent with the root mean square deviation of 2.3-7.2 percent and the ash content from 4.3 to 10.3 percent with the root mean square deviation of 0.3-3.4 percent. The calorific value of the combustible masses varied from 5,505 to 5,832 with a root mean square deviation of 18-165 calories per kilogram. Therefore, the calorific value of natural machine-molded peat differed from 2,636 to 3,376 calories per kilograms in accordance with the variation of moisture content, ash content and calorific value of the combustible masses.

Dynamics of the main qualities of peat fuel as represented in Graph 5 show that the moisture content of the peat over a 9-year period in the Sverdlovskiy, Leningradskiy, Chernoramenskiy, Gor'kovskiy trusts, was exceedingly irregular. An analysis of these indexes in individual peat enterprises gave the same results (Table 5)

Hydropeat from the Bas'yanovskiy Peat Enterprise had the least moisture content (31.4)percent over a period of years. The highest moisture-bearing peat was found in the Ozeretsko-Neplyuyevskiy Peat Enterprise. The highest root mean square deviation (5.1 percent) was observed for the Nasiyevskiy Peat Enterprise and relatively high root mean square deviations were found in the Bas'yanovskiy (4.2 percnet), Orekhovskiy (4.2 percent), and "Vasil'yevskiy Mokh" (4 percent) peat enterprises.

Although data of the past years does not indicate it, every enterprise is able to produce peat with a moisture content below 40 percent regardless of climatic conditions if special measures are taken. However, producing milled peat of low moisture content differs somewhat from producing low moisture-bearing hydropeat. The average moisture content of milled peat is determined to a considerable degree by its moisture content (fixed at 45 percent) at the time of gathering. However, the moisture content of milled peat produced in the different enterprises varies considerably (see Table 6).

The ash content of average peat fuel did not vary much during the period (Table 7). For hydropeat it varied from 9.8 to 11.2 percent; for milled peat, from 7.9 to 9.9 percent. The extent of the variation of the ash content and of the calorific value of the combustible mass in fuel in natural form produced in the various trusts is shown for hydropeat in Table 8, for milled peat in Table 9, and machine-molded peat in Table 10. As is evident from these tables, both the ash content and the calorific value fluctuate rather considerably. Variation of the moisture content is also an important factor in the fluctuation of the natural calorific value.

Conclusions

1. Moisture variation reached 7 percent in extracted peat, 3 percent in delivered lump peat, and 4-5 percent in delivered milled peat. The lowest moisture content (33 percent) was observed in lump peat in 1944 and 1948.

2. Moisture variation of processed peat in the different enterprises during the same season was 2-8 percent in similar climatic zones and 10-17 percent in different climatic zones.

3. To obtain peat of improved quality, norms for draining the peat fields should be increased, the depth of inundating hydropeat fields should be adjusted according to season, and the peat should be dried at the appropriate time.

Table 1. Characteristics of Peat Fuel at Time of Delivery

	Moisture Content (%)		Ash Content (%)		Calorific Value (cal/kg) Combustible Mass		Fuel in Natural Form	
Type	Avg	RMS ±σ	Avg	RMS ±σ	Avg	RMS ±σ	Avg	RMS ±σ
Hydro-peat	36.3	4.5	9.6	3	5,610	135	2,790	550
Milled Peat	44.5	3.1	8.3	2.4	5,660	212	2,440	530
Machine-moulded Peat	34.8	5.5	6.4	2.3	5,650	178	3,035	605

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Table 2. Hydropeat Index by Trusts

Name of Trust	Moisture Content (%) Avg	Moisture Content (%) RMS ±σ	Ash Content (%) Avg	Ash Content (%) RMS ±σ	Calorific Value (cal/kg) Combustible Mass Avg	Combustible Mass RMS ±σ	Fuel in Natural Form Avg	Fuel in Natural Form RMS ±σ
Gor'kovskiy	33.0	2.1	7.5	1.7	5,577	37	3,050	245
Ivanovskiy	35.7	3.7	8.3	1.0	5,584	49	2,881	300
Kalininskiy	38.8	3.6	7.8	0.9	5,597	100	2,733	345
Kirovskiy	35.1	--	13.0	--	--	--	--	--
Leningradskiy	37.2	1.9	9.4	1.2	5,528	24	2,730	190
Orekhovskiy	36.4	3.7	10.2	1.3	5,684	57	2,834	330
Sverdlovskiy	32.1	4.2	9.1	0.4	5,497	--	2,990	245
Chernoramenskiy	36.9	2.1	11.6	1.1	5,596	29	2,713	205
Shaturskiy	35.9	3.7	11.6	2.6	5,675	57	2,806	400
Yaroslavskiy	39.0	3.5	11.4	1.5	5,646	100	2,632	370

Table 3. Milled Peat Index by Trusts

Peat Trusts	Moisture Content (%) Avg	Moisture Content (%) RMS ±σ	Ash Content (%) Avg	Ash Content (%) RMS ±σ	Calorific Value (cal/kg) Combustible Mass Avg	Combustible Mass RMS ±σ	Fuel in Natural Form Avg	Fuel in Natural Form RMS ±σ
Gor'kovskiy	45.3	2.5	9.7	1.4	5,908	36	2,478	260
Ivanovskiy	47.3	3.0	8.9	0.8	5,474	55	2,181	255
Kalininskiy	43.9	2.6	7.7	0.5	5,608	129	2,467	300
Kirovskiy	47.6	1.4	9.8	1.6	--	--	--	--

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Table 3 (Contd)

Peat Trusts	Moisture Content (%) Avg	RMS ±σ	Ash Content (%) Avg	RMS ±σ	Calorific Value (cal/kg) Combustible Mass Avg	RMS ±σ	Fuel in Natural Form Avg	RMS ±σ
Leningradskiy	46.9	1.1	6.9	0.7	5,728	34	2,382	135
Orekhovskiy	46.9	2.2	9.4	0.7	5,786	51	2,339	215
Sverdlovskiy	40.2	2.6	9.1	2.3	5,488	79	2,561	335
Smolenskiy (Pal'tso P.E.)	47.1	3.7	11.5	1.9	5,355	67	2,065	355
Shaturskiy	45.5	1.9	7.2	1.3	5,773	86	2,477	265
Yaroslavskiy	46.5	2.5	10.2	1.2	5,478	55	2,183	250

Table 4. Machine-Molded Peat Index by Trusts

Gorkovskiy	28.9	2.7	9.2	2.5	5,832	165	3,376	455
Ivanovskiy	33.0	4.8	4.3	1.6	5,505	53	3,178	390
Kalininskiy	39.3	4.8	6.4	2.6	5,619	22	2,764	420
Kirovskiy	43.9	3.7	10.3	0.5	--	--	--	--
Leningradskiy	37.1	2.3	4.7	0.5	5,718	102	3,000	260
Orekhovskiy	35.6	7.2	7.6	3.4	5,738	79	2,999	655
Sverdlovskiy	33.9	1.5	7.8	0.3	5,589	18	2,995	120
Shaturskiy	31.6	5.3	6.8	0.3	5,708	121	3,236	430
Yaroslavskiy	40.8	3.0	8.2	0.8	5,634	94	2,636	300

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Table 5. Moisture Content of Hydropeat

Peat Enterprises	Moisture Content Avg (%)	Moisture Content RMS ±σ
Bas'yanovskiy	31.4	4.2
Gusevskiy	32.0	3.5
Sitnikovskiy	33.4	2.7
Baksheyevskiy	33.4	2.7
Oktyabr'skiy	35.4	3.9
Tugoleyeskiy Bor	35.7	3.7
Petrovsko-Kobelevskiy	35.8	3.5
Dunilovskiy	35.9	2.6
Markovo-Sborniy	36.0	3.8
Orekhovskiy	36.1	4.2
Chistiy	36.2	2.1
Modelovskiy	36.4	2.9
Pervomayskiy	36.4	3.0
Naziyevskiy	36.6	5.1
Imeni Klasson	36.8	3.7
Rybinskiy	37.2	2.0
Irinovskiy	37.5	3.5
Chernoramenskiy	37.8	2.5
Karinskiy	35.4	0.5
"Vasil'yevskiy Mokh"	38.2	4.0
Mugreyevskiy	38.5	1.1
Teykovskiy	38.6	3.7
Reshetnikovskiy	38.8	3.4
Krasno-Presnenskiy	39.3	3.5
Varegovskiy	42.2	4.1
Ozeretsko-Neplyuyevskiy	43.0	1.1

Table 6. Moisture Content of Milled Peat

Peat Enterprises	Moisture Content Avg (%)	Moisture Content RMS ±σ
Shirokorechenskiy	40	3.0
Reshetnikovskiy	42.9	4.0
Savat'yevskiy	43.5	3.4
Yeror'yevskiy	43.5	2.7
Krasno-Presnenskiy	43.7	3.6
Pervyy Shaturskiy	44.4	2.7
Sormovskiy	44.8	2.7
Shcheglovskiy	45.1	2.4
Irinovskiy	45.5	2.2
Berendeyevskiy	46.1	2.4
Kalininskiy	46.1	2.7
Dunay	46.3	3.2
Gubinskiy	46.3	2.1
Ozeretskiy	46.5	2.0
Karinskiy	46.6	2.6
Vtoroy Shaturskiy	46.6	1.8
Teykovskiy	46.8	2.4
Pal'tso	46.8	4.4

Table 6 (Contd)

Peat Enterprises	Moisture Content Avg (%)	Moisture Content RMS ±6
Varegovskiy	47.1	2.8
Imeni Klasson	47.1	3.0
B. Pikinskiy	48.3	1.9
Ozeretsko-Neplyuyevskiy	48.4	3.1
Shuvalovskiy	50.4	1.6

Table 7. Ash Content

Type of Peat	1940	1941	1942	1943	1944	1945	1946	1947	1948
Hydropeat	10.5	9.8	10.3	11.2	11.0	10.4	10.6	10.35	9.9
Milled Peat	8.1	9.6	8.3	7.9	7.9	8.9	7.9	9.68	9.92

Table 8. Hydropeat

Extent of Variation

Trusts	Ash Content Average	Ash Content RMS ±6	Calorific Value Average	Calorific Value RMS ±6	Fuel in Natural Form
Gor'kovskiy	6.3	2.0	5,573	35	3,067
Ivanovskiy	7.5-10.3	1.5-3.2	5,477-5,803	17-159	2,658-3,142
Kalininskiy	5.4-13.1	0.6-2.8	5,250-5,690	35-120	2,173-2,873
Kirovskiy	11.8	0.9	5,519	12	2,612
Leningradskiy	12.1-9.7	1.1-1.3	5,463-5,648	17-89	2,682-2,747
Orekhovo-Zuyevskiy	8.6-12.0	1.8-1.9	5,626-5,781	70-98	2,805-2,811
Sverdlovskiy	9.3	0.5	5,473	32	3,006
Chernoramenskiy	7.3-15.8	0.9-1.9	5,557-5,688	38-87	2,518-2,792
Shaturskiy	10.1-13.6	1.7-2.7	5,557-5,807	40-97	2,762-2,945
Yaroslavskiy	5.0-12.1	0.6-1.8	5,464-5,695	28-89	2,403-2,945

Table 9. Milled Peat

Extent of Variation

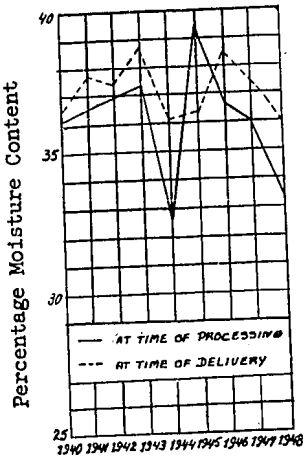
Trusts	Ash Content Average	Ash Content RMS ±σ	Calorific Value Average	Calorific Value RMS ±σ	Fuel in Natural Form
Gor'kovskiy	9.9-16.0	1.0-2.8	5,711-5,910	37	2,042-2,500
Ivanovskiy	9.4-17.1	1.3	5,408-5,850	74	1,867-2,163
Kalininskiy	6.6-9.4	0.7-2.2	5,565-5,653	85-222	2,460-2,497
Kirovskiy	8.9-10.7	1.1-2.2	5,568-5,739	39-194	2,254-2,314
Leningradskiy	5.3-17.7	0.9-1.4	5,200-5,939	26-141	2,086-2,569
Orekhovo-Zuyevskiy	7.5-11.9	0.5-1.7	5,519-5,832	47-77	2,266-2,441
Shaturskiy	6.7-9.9	0.5-1.0	5,639-5,855	56-115	2,435-2,622

Table 10. Machine Molded Peat

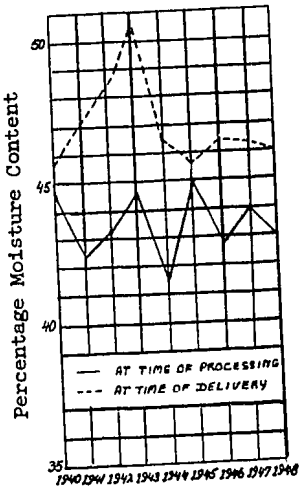
Extent of Variation

Trusts	Ash Content Average	Ash Content RMS ±σ	Calorific Value Average	Calorific Value RMS ±σ	Fuel in Natural Form
Kirovskiy	7.6-10.1	0.6-2.0	5,745-5,562	21-110	2,381-2,940
Leningradskiy	5.0-6.0	1.2-1.4	5,310-5,858	119-166	2,491-3,158
Sverdlovskiy	6.3-8.4	0.1-0.8	5,437-5,633	7-18	2,818-3,228
Yaroslavskiy	7.1-10.2	0.7	5,519-5,601	131-199	2,465-2,608

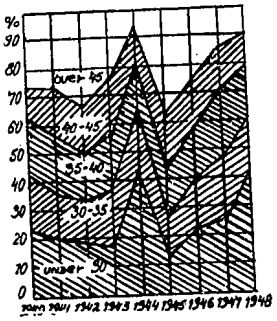
Graph 1. Lump Peat



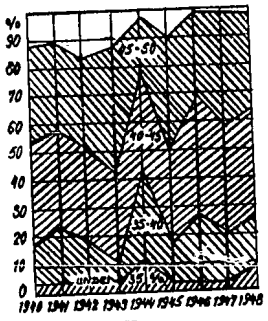
Graph 2. Milled Peat



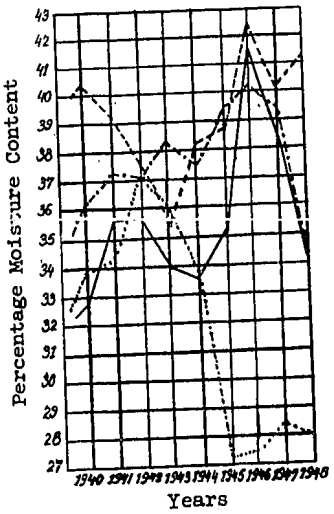
Graph 3. Lump Peat



Graph 4. Milled Peat



Graph 5. Peat



Legend

--- Chernoramenskiy
— Gor'kovskiy
--- Leningradskiy
... Sverdlovskiy

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